

The lateness of the season of course gave me an excellent opportunity to examine the plant in full fruit. After a careful examination of many plants I failed to find any trace of that regularity of arrangement of the achenes on the receptacle attributed to this species of *Echinodorus* in some botanical works. There seems, therefore, no cause to refer the species to *Alisma*, as several authors have done.

BOSTON, MASSACHUSETTS.

THE GENERIC POSITION OF ECHINODORUS PARVULUS.

B. L. ROBINSON.

(Plate 45, figures 1-10.)

WHILE examining some excellent material of the rare *Echinodorus parvulus*, Engelm., kindly placed at my disposal by E. L. Rand, Esq., I have had occasion to review the opinions, which have been expressed regarding the correct classification of this species, and some notes on the subject may be of interest.

The North American plant bearing this name was originally described by Dr. George Engelmann¹ as *Echinodorus subulatus*. It was so named under the impression that it was the *Alisma subulatum* of Linnaeus,² a species which later proved to be *Sagittaria pusilla*, Nutt. Our little *Echinodorus* was accordingly rechristened by Engelmann³ and called *E. parvulus*. The propriety of this change can scarcely be questioned when we consider that the earlier name, *E. subulatus*, rested upon a confusion of two quite distinct elements, namely, the synonym *Alisma subulatum* and a true *Echinodorus*. In such cases it may be assumed that the status of the combination should be determined rather by the name-bearing synonym than by the material which was erroneously identified with it.

Echinodorus parvulus matures about fourteen carpels, which being arranged spirally upon a strongly convex receptacle form a

¹ Engelm. in Gray, Man. ed. 1, p. 460 (1848).

² Spec. Pl. i. 343 (1753).

³ Engelm. in Gray, Man. ed. 2, p. 438 (1856).

globose head quite after the manner of the achenes in a *Ranunculus*. This is well shown in the excellent drawing by Mr. F. Schuyler Mathews, Plate 45, figure 2. The individual carpels (figure 3) are reddish brown, strongly 5-ribbed on the back and 3-ribbed ventrally. The stigma is essentially sessile and the beak at maturity very small or wanting. *Echinodorus*, although named by Richard¹ and treated by several subsequent authors as a section of *Alisma*, was first described as a genus by Engelmann, and was separated from *Sagittaria* chiefly by its perfect flowers and from *Alisma* by the fact that the achenes are thus arranged in a head and not in a ring. The genus has been sustained by the two high authorities, Buchenau and Micheli, who have subsequently given monographic attention to the *Alismaceae*. The distinction becomes especially clear when as in Professor Buchenau's admirably lucid treatment² the genus *Alisma* is confined to its more typical species. The marked difference in the fruit will be readily apparent if the reader will examine figures 2 and 10, representing the fruit of *E. parvulus* and *E. radicans* respectively, and will compare them with figure 9, showing the fruit of our common *Alisma Plantago*.

In 1830, some eighteen years before our little North American *Echinodorus* was characterized, a South American plant of identical habit from the palm swamps of Brazil was very fully described as *Alisma tenellum*, Mart.³ The carpels of this Brazilian plant were described as "4-12, plures ut videtur abortivae, in orbem fere dispositae, attamen minus regulariter et multo minus approximatae quam in *A. Plantagine*" and in a later figure, published in the *Flora Brasiliensis* by Seubert, the carpels are clearly represented in a single ring. This figure accurately redrawn is shown in figure 6 of plate 45. In 1868 Professor Buchenau⁴ in a general recension of the *Alismaceae* transferred *Alisma tenellum* to *Echinodorus*, forming the new combination *Echinodorus tenellus*. At the same time he states⁵ that he had found no specific distinctions between this South American plant and the North American *E. parvulus*. Micheli⁶ in the most exhaus-

¹ Mém. Mus. Par. i. 365 (1815).

² Buchenau in Engl. & Prantl, Nat. Pflanzenf. ii. Abt. 1, 227-232.

³ Martius acc. to J. A. & J. H. Schultes, Syst. vii. pt. 2, 1600 (1830).

⁴ Abh. naturw. Ver. Bremen, ii. 21 (1868).

⁵ Buchenau, l. c., 38.

⁶ Micheli in A. & C. DC. Monog. Phan. iii. 48 (1881).

tive revision of the group, which has yet appeared, also treats *E. parvulus* as a synonym of *E. tenellus*. Curiously neither Buchenau nor Micheli speaks of the uniseriate carpels, originally described in Schultes' *Systema*¹ and so clearly figured by Seubert in the *Flora Brasiliensis*,² although both of the later authors refer to the plate in question. Struck by the difference between the North American and the figure of the Brazilian plant I have examined all the South American specimens of *Alisma tenellum* (*Echinodorus tenellus*) in the Gray Herbarium and find that they agree perfectly in having capitate, spirally arranged achenes, quite in the manner of the North American *E. parvulus*, with which, in other respects also, the South American plant appears specifically identical.

The question at once presents itself whether we have here to do with two South American plants, one with achenes in a single ring and the other with achenes in a head. There are many reasons, however, for believing that this is not the case, but that not only the original description of *Alisma tenellum* but Seubert's description and figure are entirely in error in representing the carpels in a single ring. This question can only be decided by the examination of the original material of the species. Happily, to those of us who apply priority under the genus, the doubt about the true South American *Alisma tenellum* will in no way affect the standing of our own *Echinodorus parvulus*.

Until 1895 the North American plant was uniformly referred to *Echinodorus*, but of late in the *Memoirs of the Torrey Botanical Club*,³ in the *Illustrated Flora*,⁴ and in Professor Britton's recently issued *Manual*,⁵ it is classified as an *Alisma*. It is natural to suppose that this transfer, made in direct opposition to the expressed views of three such authoritative writers and specialists upon the *Alismaceae* as Engelmann, Buchenau, and Micheli, would have demanded more than ordinary care and attention to the actual characters; and it is accordingly disappointing to find, on the contrary, that the fruit, in which, as we have seen, the chief generic distinctions are to be found, instead of being critically studied could not have received even the most cursory inspection by the writers making the transfer.

As shown above, the early representation of *Alisma tenellum*, pub-

¹ vii. pt. 2, 1600 (1830).

⁴ i. 85 (1896).

² Seubert in Mart. Fl. Bras. iii. pt. 1, 105 (1847), t. 13, f. II.

³ v. 24 (1895).

⁵ p. 54 (1901).

lished in the *Flora Brasiliensis*¹ and reproduced in our figure 6, is of a very doubtful nature. If it is correct it must represent an otherwise unknown South American plant, which with its single row of carpels certainly can have nothing to do with our North American capitate-fruited *Echinodorus parvulus*. If, however, we choose the other horn of the dilemma and assume that *Alisma tenellum* was in reality nothing but *Echinodorus parvulus*, we are forced to the conclusion that the figure in the *Flora Brasiliensis* is a mistake as to carpels.

It is truly remarkable that another artist in preparing the figure for the *Illustrated Flora* has fallen into the same curious error and has produced a picture which in its contours, in the curve of each filament, and in the annular arrangement of the carpels, is so like a looking-glass replica of the one in the *Flora Brasiliensis*, that it would be hard to believe that it had not been mechanically reproduced, were we not informed in the preface of the *Illustrated Flora* that the cuts for the work were "all from original drawings." Unfortunately, the accompanying text is also neither accurate nor consistent. On page 84 *Alisma* is said in the key to have the carpels in a ring, but it is described a few lines below as having the ovaries in one or several whorls. On page 85, although figured with achenes in a single ring, *Alisma tenellum* is described as having its achenes in several whorls. As we have seen, whatever may have been the case in the original *A. tenellum*, the achenes of the North American plant under discussion are neither in a ring nor in several whorls, but are spirally arranged in a head, and in this regard, as in every other, the plant is a good *Echinodorus*, the genus to which it has been uniformly referred in all editions of Gray's *Manual* and by the foreign specialists who have worked upon the group.

There are in North America three species of *Echinodorus*, each of which is beautifully characterized by its carpels. In the little *E. parvulus*, the rarest of the three, they are (as shown in figure 3) rounded at maturity, glandless and essentially beakless. In *E. rostratus*, Engelm. (*E. cordifolius* Griseb.) they are (as shown in figure 8) provided with a conspicuous erect beak and with two small amber colored glands on each lateral face near the summit, while in *E. radicans*, Engelm. (figure 7) the beak is incurved and there is a single

¹ iii. pt. 1, t. 13, f. II.

larger gland near the centre of each lateral face. *E. parvulus* is the only one of these species as yet found in the northeastern states and in this region seems to have been found only at the Winter Pond station in Winchester, Massachusetts, and many years ago in fresh water pools near Mt. Auburn, Massachusetts. The species has been found several times in the neighborhood of St. Louis, Missouri, and on the Illinois side of the Mississippi by Dr. Engelmann and by Mr. Henry Eggert, at Canterbury, Delaware by Mr. W. M. Canby, on the Santee Canal, South Carolina, by Mr. H. W. Ravenel, in Decatur County, Georgia, by Mr. R. M. Harper, and at Tampa and Dunnellon, Florida, by Mr. A. H. Curtiss. There are also indefinite reports of its occurrence in Michigan and on the north shores of Lake Superior. These last records need substantiation and, in general, the rarity of the species is such that the discovery and record of new stations will have more than ordinary interest. It is not improbable that the species from its small size, inconspicuous flowers, and habit, to which Mr. Rand has called attention, of growing in some cases entirely under water, has been overlooked in many localities where it really occurs.

Plate 45, figure 1, representing the flower of *Echinodorus parvulus* shows the petals very short and distinctly obcordate, but it should be said that this was drawn from a young flower scarcely in anthesis, and that a more mature flower would probably exhibit relatively larger petals, which perhaps lose something of their obcordate form. The petals are so thin and "deliquescent" that, it is by no means easy to trace their mature form in dissections made from dried material.

EXPLANATION OF PLATE 45, FIGURES 1 TO 10. Fig. 1, *Echinodorus parvulus*, Engelm., young flower; fig. 2, the same, fruiting head; fig. 3, the same, carpel; fig. 4, the same, submersed state, showing phyllodial leaves; fig. 5, the same, emerged state, showing usual leaf-form. Fig. 6, reproduction of Seubert's probably incorrect figure of the flower of *Alisma tenellum*, Mart. Fig. 7, *Echinodorus radicans*, Engelm., carpel. Fig. 8, *E. rostratus*, Engelm., carpel. Fig. 9, *Alisma Plantago*, L., fruiting head, showing annular arrangement of carpels. Fig. 10, *Echinodorus radicans*, Engelm., fruiting head, showing capitate carpels.

GRAY HERBARIUM.